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THE WAR BURDENS OF WATER WORKS IN THE UNITED STATES CONTINUE¹

BY LEONARD METCALF²

Through the courtesy of their managers it has been made possible to extend to January 1, 1920, the data submitted in 1918 and 1919 to this Association, upon the trend of prices in the water works construction and operating fields, based upon the actual experiences of about 50 water works in various parts of the United States, having a gross annual revenue of about \$34,000,000 and serving an aggregate population of upwards of nine million.

In the light of the burdensome increase in cost of living, even since the termination of the war by the declaration of the armistice, and the many evidences of profiteering in different fields and commodities, it is gratifying to be able to say that as a whole, and probably without substantial exceptions, the water works of this country have met their obligations to the public in a conscientious, effective and adequate manner, in spite of dangerous reduction in profit in almost all cases and its actual elimination in many.

In table 1 is shown a summary of data upon increase in cost of unskilled labor and of materials used in the construction and operation of water works.

Labor costs. Unskilled labor costs continued their advance during the year 1919 and are yet higher today. The percentage of increase in cost per hour over prewar (1915) prices averaged about 80 per cent, approximately 70 per cent in the western and central groups and 90 per cent in the eastern and southern. The average increase for the year 1919 over 1918 is about one-eighth. These results are also shown diagrammatically in figure 1.

While the efficiency of labor is probably slightly better than during the war period, it is still far below prewar standards. It is conservative to say that taking productivity into consideration, as

¹Read at the Montreal Convention, June 24, 1920. Discussion of this paper is desired and should be sent to the Editor.

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TABLE 1

Summary of data upon increase in cost of unskilled labor and materials to water works in the United States, from prewar basis (characterized by 1915 costs) up to 1920

ITEM	NUMBER OF RECORDS ON DIFFERENT YEARS	PRICES PER UNIT					PERCENTAGE INCREASE OVER 1915 (PREWAR BASIS)			
		1915	1916	1917	1918	1919	1916	1917	1918	1919
1. Unskilled labor in cents per hour										
(a) Eastern Group.....	15-18	23.0¢	26.7¢	30.4¢	40.2¢	43.8¢	16	32	75	91
(b) Central Group.....	10-12	21.7¢	25.3¢	26.9¢	37.2¢	36.8¢	17	24	71	70
(c) Southern Group.....	9-12	17.9¢	20.6¢	24.5¢	34.3¢	34.4¢	15	37	92	92
(d) Western Group.....	7-8	27.0¢	28.5¢	31.4¢	41.8¢	46.4¢	5	16	55	72
(e) Average of Groups.....		22.4¢	25.3¢	28.3¢	38.4¢	40.4¢	13	27	71	80
2. Cast iron pipe per 2000 pounds, approximately..	17-21	\$24.23	\$30.70	\$51.60	\$67.74	\$69.20*	27	113	179	184
3. 6-inch valves.....	11-38	11.18	12.64	19.13	19.13	20.73	13	71	71	85
4. 12-inch valves.....	3-38	34.78	41.53	65.22	65.02	59.66	19	88	87	72
5. 2-way hydrants.....	6-38	26.69	32.04	43.13	51.80	47.16	20	62	94	77
6. Coal per 2000 pounds										
(a) Eastern Group.....	13-15	\$2.98	\$3.80	\$5.96	\$6.00	\$5.41	27	100	101	82
(b) Central Group.....	11-12	2.41	2.77	3.75	4.53	4.55	15	56	88	89
(c) Southern Group.....	12-9	1.92	2.01	3.03	3.89	3.78	5	58	102	97
(d) Western Group†.....	5-4	3.97	4.37	6.31	7.92	4.70	10	59	99	18†
(e) Average of Groups.....		\$2.82	\$3.24	\$4.77	\$5.57	\$4.61	15	69	97	63
7. Fuel oil in cents per gallon.										
South.....	1	1.80¢	1.80¢	2.00¢	4.28¢		0	11	138	
West.....	1-4	1.38¢	1.50¢	2.57¢	4.05¢	4.09¢	9	86	193	197
8. Alum, cents per pound										
(a) Eastern Group.....		1.12¢	1.72¢	1.48¢	1.45¢	1.66¢	54	33	29	48
(b) Central Group.....		0.91	0.91	1.25	1.50	1.40	0	37	65	54
(c) Southern Group.....		1.08	1.38	1.48	1.78	1.56	28	37	65	44
(d) Western Group.....		1.14	1.21	1.51	1.53	1.79	6	32	34	57
(e) Average of Groups.....		1.06¢	1.30¢	1.43¢	1.56¢	1.60¢	22	35	47	51
(f) Average New York price.....		2.08¢	4.63¢	3.57¢						

* Range \$50.60 to \$83.50 per ton.

† Small number makes record of doubtful value.

Note: The following data were received from a large Southern city too late for inclusion in the above table:

Average cost of common labor: 36 to 42 cents per hour; at present (1920), 42 to 45 cents.

Cast iron pipe: \$48.80 to \$63.80.

Valves; 6-inch, \$31.80; 12-inch, \$72.90.

Two-way hydrants, 4-inch, 4½ feet depth: \$53.75.

Coal, per 2000 pounds: \$4.36.

Fuel oil, per gallon: 0.79 to 1.70 cents; average, 1.06 cents.

Fig. 1 INCREASE IN COST OF UNSKILLED
OVER PRE-WAR (1915) BASI

WITHOUT ALLOWANCE FOR LOSS IN EFFICIE
OUTPUT WHICH IS ESTIMATED AT 25 % MORE

LEONARD METCALF - BOSTON, MASS

GROUP	CENTS PER HOUR					PER CE. OVER (1915)	
	1915	1916	1917	1918	1919	1916	1917
EASTERN	23.0	26.7	30.4	40.2	43.8	16	3
CENTRAL	21.7	25.3	26.9	37.2	36.8	17	2
SOUTHERN	17.9	20.6	24.5	34.3	34.4	15	3
WESTERN	27.0	28.5	31.4	41.8	46.4	5	14
AVERAGE OF 4 GROUPS	22.4	25.3	28.3	38.4	40.4	13	2

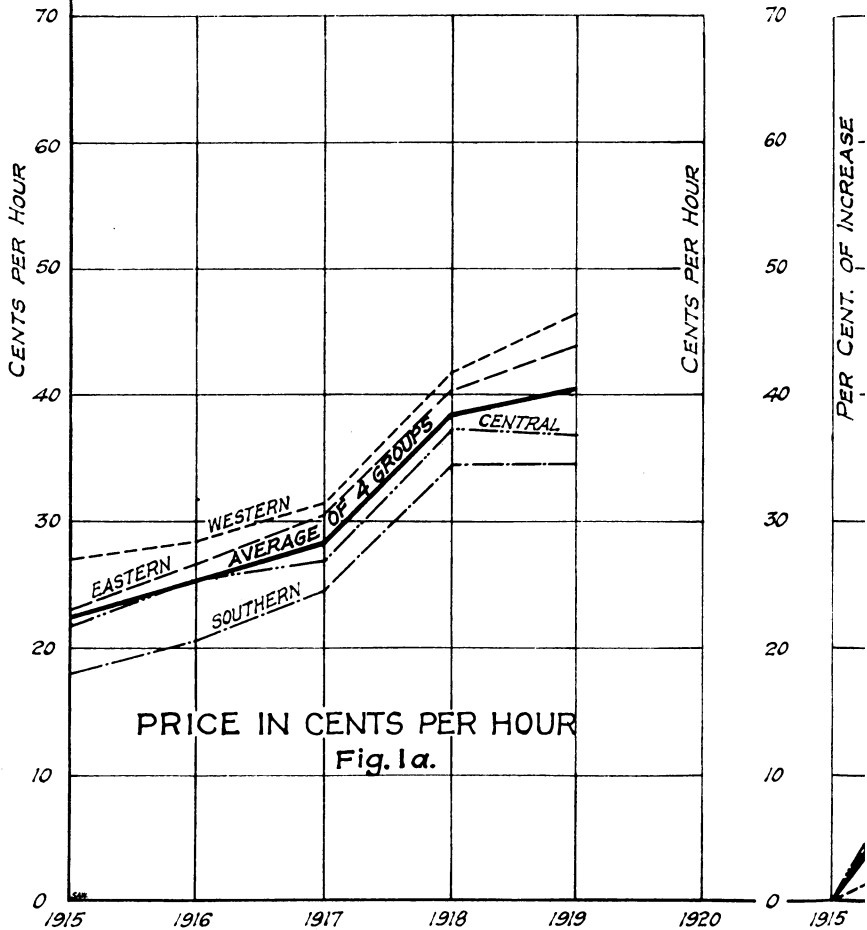


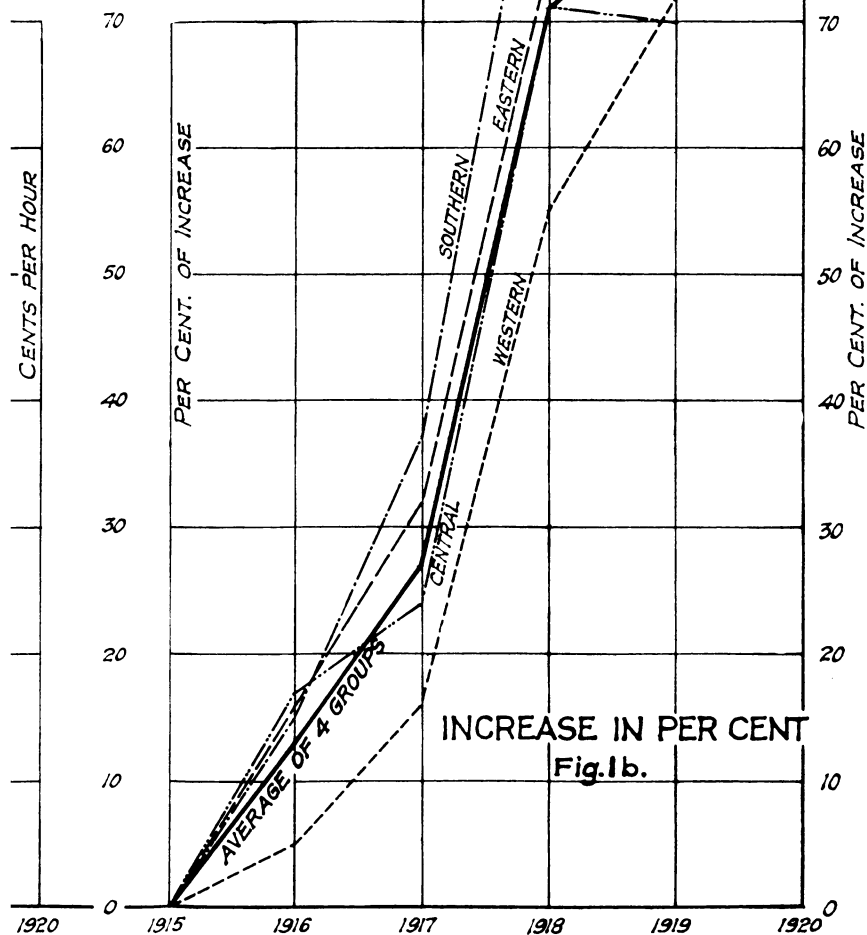
FIG. 1. FLUCTUATION IN WAGES OF U

UNSKILLED LABOR ON (1915) BASIS

LOSS IN EFFICIENCY OR
ED AT 25 % MORE OR LESS

- BOSTON, MASS.

		PER CENT. INCREASE OVER (1915) PRE-WAR BASIS			
1918	1919	1916	1917	1918	1919
1.2	43.8	16	32	75	91
1.2	36.8	17	24	71	70
1.3	34.4	15	37	92	92
1.8	46.4	5	16	55	72
1.4	40.4	13	27	71	80



ON IN WAGES OF UNSKILLED LABOR

well as the price paid per hour, the cost of unskilled labor is more than double its prewar cost.

Cast iron pipe prices are today practically three times normal prewar prices; the *cost of valves and hydrants* slightly less than double.

Coal prices have receded somewhat, more nearly approaching the conditions of 1917 than 1918.

TABLE 2

Labor prices paid by water works in the vicinity of Boston, March 23, 1920

PLACE	UNSKILLED LABOR PER DAY, NOMINAL RATES	UNSKILLED LABOR PER HOUR, ACTUAL RATES	PIPE LAYERS AND CALKERS, PER DAY	PIPE LAYERS AND CALKERS, PER HOUR	HOURS PER WEEK	HOLIDAYS	VACATION, 2 WEEKS PAID	INCREASE IN WAGES ANTICIPATED
Boston.....	\$4.00	\$0.586	\$4.25-5.00	\$0.621-0.732	44	Paid	Yes	No
Somerville.....	3.75	0.549	3.85	0.564	44	Paid	Yes	
Newton.....	4.00	0.526	4.24-4.32	0.557-0.568	44	Not paid	No	?
					48			
Lexington.....	3.50	0.437	3.75	0.469	48	Not paid	No	Yes
Waltham.....	4.16	0.589	4.48	0.635	44	Not paid	Yes	No
Everett.....	4.25	0.621	4.75	0.621	44	Paid	Yes	Yes
Chelsea.....	4.00	0.586	4.25	0.621	44	Paid	Yes	No
Quincy.....	4.00	0.586	4.50	0.659	44	Paid	Yes	No
Medford.....	4.25	0.621	5.00	0.732	44	Some	Yes	
Melrose.....	4.00	0.586	4.25-4.50	0.621	44	Paid	Yes	Yes
Revere.....								
Watertown.....	4.00	0.586	4.25	0.621	44	Paid	Yes	Yes
Arlington.....	4.00	0.586	4.25-4.50	0.621	44	Paid	Yes	Yes
Milton.....	4.00	0.534	4.50	0.600	48	Paid	Yes	No
Winthrop.....	4.00	0.534	4.25	0.567	48	Paid	Yes	No
Cambridge.....	4.00	0.586	4.25	0.621	44	Paid	Yes	
Brookline.....	4.25	0.584	4.42	0.608	44-48	Paid	Yes	No
Marlboro.....	4.00	0.500	4.25	0.531	48	Not paid	No	Yes
Hudson.....	4.00	0.518	4.50	0.582	48	Not paid	Yes	No
Fitchburg.....	4.40	0.569	4.96	0.642	48	Not paid	Yes	
Beverly.....	4.50	0.659	4.75	0.694	44	Paid	Yes	
March 23, 1920.....	\$4.05		\$4.38		13 of 44;	14 Paid	17 Yes	
Average.....	50.6¢	56.7¢	54.7¢	61.0¢	8 of 48	6 Not	3 No	
April, 1919.....	\$3.46		\$3.82		15 of 44;	13 Paid	16 Yes	
Comparative average..	43.2¢	46.1¢	47.7¢	51.0¢	7 of 48	8 Not	5 No	

In table 2 are given comparative figures showing unskilled labor wages paid by water works in the vicinity of Boston, as of the end of March, 1920. Comparing them with the records of a year earlier the nominal increase in rate per hour has been from 43.2 to 50.6

cents; the actual increase, including allowance for holidays and vacation leave, from 46.1 cents to 56.7 cents per hour, 21 per cent. Fourteen out of 20 departments grant holiday leave under full pay, and 17 out of 20, two weeks vacation annually under pay.

In figure 2³ are shown the gross annual revenue, operating expenses including taxes, and the net annual revenue applicable to depreciation, interest, dividends and surplus, of 46 works arranged in four groups covering the eastern, central, southern and western sections of the country. The percentage increases over the prewar conditions, exemplified by those of the year 1915, are given, together with the average rate of increase applicable to the entire list.

Attention is called pointedly to the fact that these figures are shown in two ways, with and without the inclusion of the records of the cities of Detroit and Mingo Junction. The conditions there prevailing have been so very abnormal, it is believed, as to require the elimination of these records from consideration in deriving average figures.

From this record it appears that *the gross annual revenue* has increased in the years 1916 to 1919, inclusive, over prewar conditions, progressively, by 8.5, 13.5, 22.7 and 24.5 per cent. These amounts are all substantially below a normal rate of increase for such works.

The operating expenses including taxes have increased progressively over the prewar basis by approximately one-eighth, one-third, one-half and slightly over one-half.

The net revenue, without deduction for and therefore applicable to depreciation, interest, dividends and surplus, has increased over the prewar (1915) basis by 3.4, -0.4, 4 and 8.5 per cent. This increase is less than half of what would be expected for such works in normal times. These figures indicate that in spite of the advances in rates which have been granted in many places, the net revenue of the works is not adequate to command capital for their betterment over a long period of time. They indicate further, as will be seen from the diagram, that of the net burden resulting from war conditions about half has been borne by the works; the other half by the public which they serve.

³The records of one large Southern City were received too late for inclusion in the above averages. They show an increase in gross revenue of 54.5 per cent; in operating expenses, 79.5 per cent; and in net revenue, 2.5 per cent.

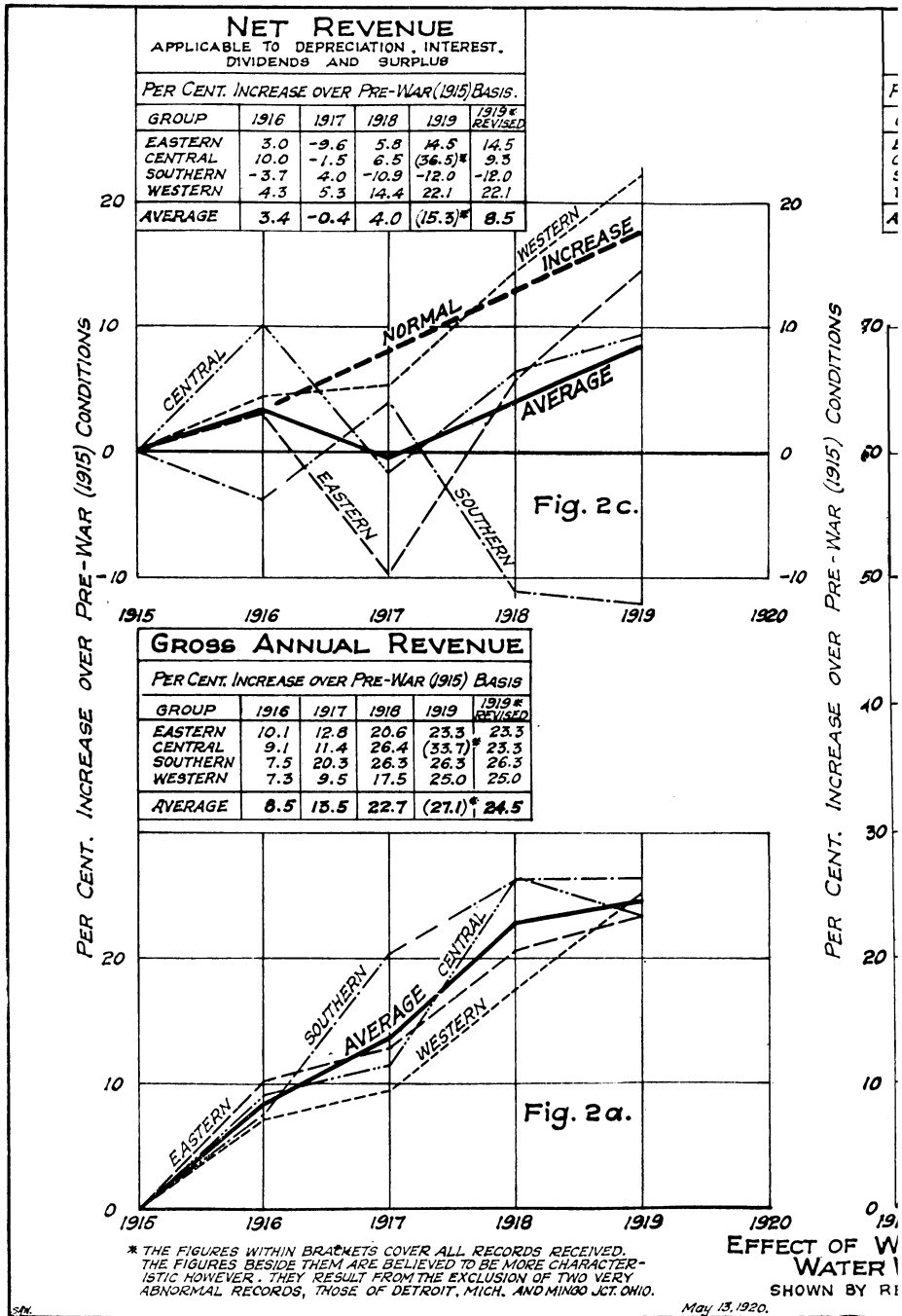


FIG. 2. FLUCTUATIONS IN OPERATING E

OPERATING EXPENSES INCLUDING TAXES

PER CENT. INCREASE OVER PRE-WAR (1915) BASIS.					
GROUP	1916	1917	1918	1919	1919* REVISED
EASTERN	21.9	41.1	49.7	47.1	47.1
CENTRAL	9.3	37.3	62.3	(75.5)*	63.1
SOUTHERN	9.7	34.6	65.9	71.5	71.5
WESTERN	9.9	17.4	28.0	36.1	36.1
AVERAGE	12.7	32.6	51.5	(57.5)*	54.4

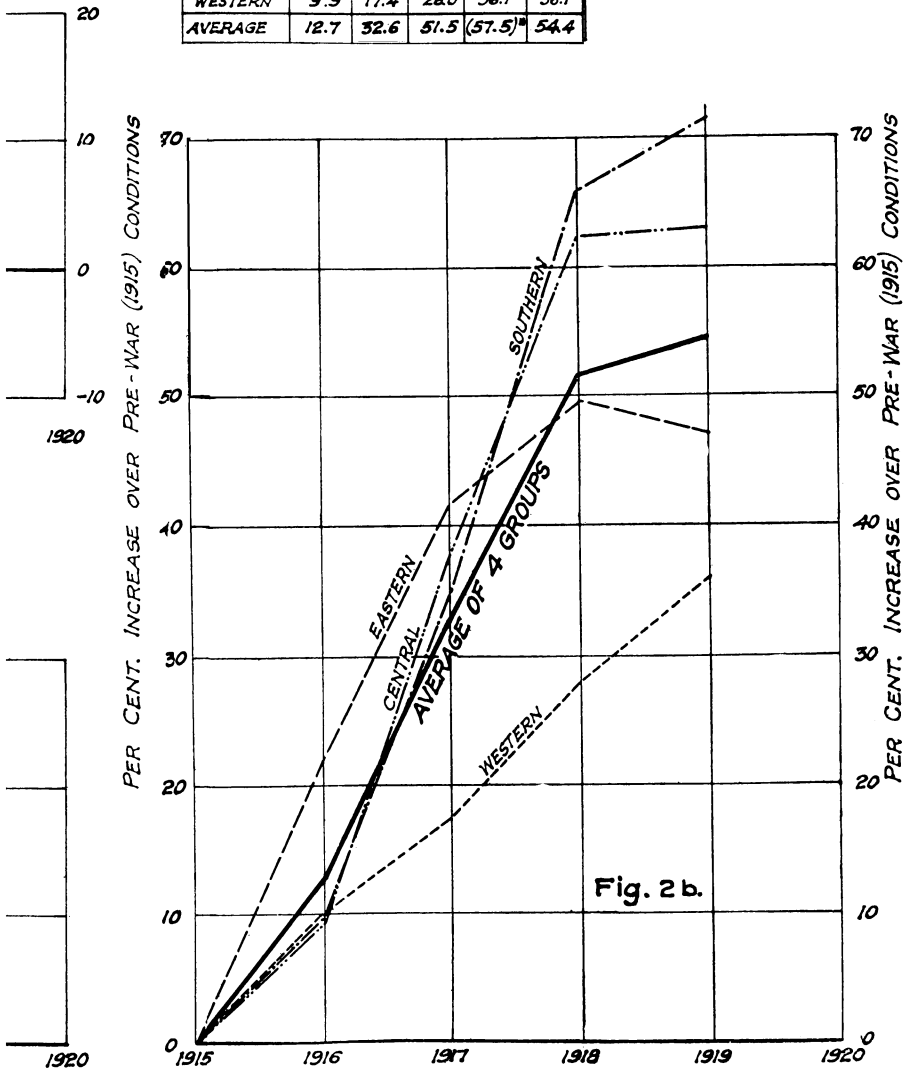


Fig. 2 b.

EFFECT OF WAR BURDENS UPON THE REVENUES AND EXPENSES OF
WATER WORKS IN THE UNITED STATES TO DEC. 31, 1919.

SHOWN BY RECORDS OF APPROXIMATELY 50 TYPICAL WATER WORKS PLANTS

13, 1920.

LEONARD METCALF - BOSTON, MASS.

A segregation of the records submitted, as between municipally and privately owned works, indicates that the increase in gross revenue for both of these has been approximately the same; that the increase in expenses has been more than twice as great for the privately owned group as for the municipally owned; and that the net revenue of the privately owned group has practically stood still while the municipally owned group has been increased approximately 40 per cent. This comparison cannot be carried too far, however, as the list of municipally owned works is not sufficiently large to be thoroughly characteristic. Moreover, in the case of the municipally owned works the records of which are included, a much greater proportion have gravity supplies than in the case of the privately owned group. This has served to minimize the increase in expenses which would otherwise have been felt. It may be that the decrease in available labor during the war period had a more material effect upon the municipal works than upon the private works and resulted in economies which would not have been possible in these public works under normal conditions. More important yet, it is to be observed that in the case of the municipal works substantially no taxes are paid, whereas in the privately owned group the taxes generally amount to about one-eighth of the entire gross revenue, and these taxes have, of course, been burdensomely increased since the war burdens began to make themselves felt. This influence is the most important one of those responsible for the comparative results referred to. As previously stated, however, limited weight only can be given to these comparative results of operation by municipally and privately owned water works.

Analysis of taxes paid by privately owned water works shows interesting results. Excluding the returns from water works located in the State of Pennsylvania, because the basis of taxation is quite different there and incomparable with that prevailing in other states, it appears with respect to the privately owned waterworks that,—under average conditions:

1. One-eighth of their gross income is paid out in taxes.
2. The tax payments are equivalent to nearly 30 per cent of the net income applicable to depreciation, interest, dividends and surplus.
3. The increase in taxes paid in the year 1919 over those paid in 1915, was 68 per cent, or slightly over two-thirds.

4. The increase in the taxes paid in 1919 over those paid in 1915 constituted 27 per cent, or slightly over one-fourth of the increase in the cost of operation (including taxes) of these works.

Summit of high prices reached. It is generally conceded that the summit of the high prices has been reached, where it has not been passed, and that, as to materials at least, and probably in lesser degree as to labor also, some recession in price is to be looked for. There is still, however, so marked a shortage of materials and labor, comparable with the demand, that construction costs are certain to remain high during the year 1920.

The financial outlook for existing water works is not encouraging. It is evident that the earnings during the war period have not been adequate to maintain the properties and pay a fair return upon their value. Such a condition cannot long continue without serious future embarrassment. The position that may be taken by the public service commissions or their regulatory authorities will be reflected later in the character of the service rendered. If fair advance in rates be granted, first class service can be maintained. If this advance be retarded or be not adequate, a declining service must result. The increase in rates in the face of the present high cost of living will be very distasteful to the public and in some cases induce active opposition. Therefore it is important that in making application for relief, the evidence should be clearly presented by the water works authorities, that the facts may speak for themselves and the difficulties of the commissions be minimized.